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IN THIS ISSUE

AGRICULTURAL RESOURCES OF SOUTH AFRICA
THE NEW FLAX INDUSTRY OF PERU

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CONTENTS

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Page

AGRICULTURAL RESOURCES OF SOUTH AFRICA 51
- Position of agriculture in South Africa's economy 51
- Climate and soils 53
- Rural population and native agriculture 53
- The pattern of agricultural production and trade 54
  - Agricultural areas 54
  - Relative importance of commodities 55
  - Agricultural surplus 56
- Wartime production trends 57
- The commodity-supply position 57
- The conservation of agricultural resources 62

THE NEW FLAX INDUSTRY OF PERU 63
- History of flax 63
- The nature of the plant 63
- Climate and soil requirements 64
- Development of flax industry in Peru 64
  - Early experimental plantings 64
  - Results of campaign to promote production 64
  - Agreement with United States 65
  - The 1942-43 harvest 66
  - Prospects for 1943-44 67
  - Methods of cultivating and processing 68
  - Diseases and pests 70
- Government aid and regulations 71
  - Laws governing production 71
  - Laws regulating processing 72
  - Export taxes 72

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AGRICULTURAL RESOURCES OF SOUTH AFRICA . . . . .

By Maurice E. Wright*

The first permanent European settlement in South Africa was made by the Dutch East India Company in 1652 to establish a refreshment station on the route to the Indies. The conflict between the Dutch and the English for the control of the South African ports occurred because both needed the ships' stores and supplies that South Africa could furnish in order to maintain transportation and communication with their respective empires. Upon completion of the Suez Canal in 1869, the South African ports declined in importance as refueling and refreshment stations. Twice within the present century, however, war has thrust upon South Africa its historic role in the commerce between the East and the West. During critical months when the Mediterranean was closed, South Africa made important contributions to the war by provisioning the immense convoys that used the Cape route. It has also been an important source of food supplies for the Tropics to the north, where strategic minerals and other badly needed war materials are produced. The basic agricultural resources of the country have made these contributions possible.

POSITION OF AGRICULTURE IN SOUTH AFRICA'S ECONOMY

The importance of agriculture in the social and economic fabric of the Union of South Africa is obscured by the attention given to the gold and diamond industries. Yet, in 1936, over one-third of the European population and three-fourths of the non-Europeans in the Union lived in rural areas.[1] This percentage has been steadily declining in recent years. The percentage of rural-dwelling Europeans declined from 44.2 percent to 35.8 percent between 1921 and 1936, and the decline for non-Europeans was from 83.6 percent to 77.5 percent in the same period.

The Union of South Africa has an area of 472,000 square miles, which is only a little less than that of the States of Texas, New Mexico, and Arizona combined. In 1941 its population totaled 10,500,000, of whom 2,200,000 were of European extraction. The Union had a population density of 20.3 persons per square mile in 1936 or less than half that of the United States as a whole. The average per square mile of the European population was only 4.2 persons. The extensive nature of South African farm operations is more graphically indicated if urban areas are excluded and the density of the rural population computed. In these areas Europeans average only 1.5 per square mile, and the density of all inhabitants is only 14.1.[2]

Population alone, though of great social significance, is not a measure of economic productivity. The Industrial and Agricultural Requirements Commission has

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* Office of Foreign Agricultural Relations.

[1] An urban area, as defined by the Union Census, is an area included within any city, borough, municipality, or village management, health committee, township, or other local board constituted under any law, and possessing some form of urban local authority.

[2] In this computation 5,710 square miles of municipal lands and more than 3,000,000 persons resident thereon are excluded.

TABLE 1.-*Density of population in the Union of South Africa, 1936 census*

ITEM	EUROPEANS	NON-EUROPEANS	ALL NATIONALITIES
	Number per square mile	*Number per square mile*	*Number per square mile*
All areas	4.2	16.0	20.3
Rural areas	1.5	12.6	14.1

Compiled from OFFICIAL YEAR BOOK OF THE UNION OF SOUTH AFRICA.

computed the percentages of total net national income contributed by different branches of the South African economy, and the results reveal the "unimpressive contribution" of rural industries to the national income.[3] Agriculture's share of the national income was low at the beginning of this period, and, while the percentage of the population in agriculture declined, the reduction in agriculture's share of the income was even greater.[4]

TABLE 2.-*Employment and earnings in various branches of the South African economy, 1936-37*

INDUSTRY	CONTRIBUTION TO NATIONAL INCOME	PERCENTAGE OF PERSONS GAINFULLY EMPLOYED	
		ACCORDING TO OCCUPATIONAL CENSUS	EXCLUDING FARMERS IN NATIVE AREAS AND CASUAL LABOR ON EUROPEAN-OWNED FARMS
	Percent	*Percent*	*Percent*
Farming[1].	12.5	63.6	33.4
Manufacturing	16.5	7.6	14.0
Mining	19.0	8.4	15.3
Commerce and finance	20.0	3.0	5.4
Public service, professions, and other	12.5	3.1	5.7
Domestic service, hotels, etc..	4.5	8.8	16.1
Transport	8.5	3.4	6.3
Other	6.5	2.1	3.8
Total	100.0	100.0	100.0

[1] Fishing and forestry excluded.

[UNION OF SOUTH AFRICA] INDUSTRIAL AND AGRICULTURAL REQUIREMENTS COMMISSION. FUNDAMENTALS OF ECONOMIC POLICY IN THE UNION. Third Interim Rpt. U. G. No. 40. 90 pp., illus. Pretoria. 1941. For method of enumeration, see pp. 18-27.

Comparative figures for 1936 (see table 2), show that, while almost two-thirds of the Union's working population are engaged in farming, they received only one-eighth of the national income. These figures, from the occupational census, include, however, about 1,750,000 natives over 10 years of age in the Reserves - areas set aside for exclusive native occupation - and some 750,000 non-Europeans undertaking casual farm labor who live at a subsistance level and receive a very small share of the farm income. If the occupational census is adjusted to exclude these groups, one-third of the remainder of the working population was engaged permanently in the farming industry and shared in the distribution of one-eighth the national income. The true employment value of the farming industry is somewhere between the position shown by the occupational census and that shown by the adjusted column.

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[3] [UNION OF SOUTH AFRICA] INDUSTRIAL AND AGRICULTURAL REQUIREMENTS COMMISSION. FUNDAMENTALS OF ECONOMIC POLICY IN THE UNION. Third Interim Rpt. U. G. No. 40. 90 pp., illus. Pretoria. 1941.

[4] The percentage of total net national income contributed by farming, forestry, and fishing was computed by the Commission as follows: 1924-25, 19.9 percent; 1927-28, 18.3; 1929-30, 15.2; 1931-32, 13.4; 1932-33, 12.2; 1933-34, 15.2; 1935-36, 12.7; 1936-37, 13.4; 1937-38, 12.1; 1938-39, 12.7. Between 1926 and 1936 the percentage of Europeans in rural areas declined from 42 to 35 percent. Thus a proportionate decline in the farm share of national income would have given rural groups 15 percent in 1936 as compared with 12.7 percent, which they actually received in 1935-36 and the 13.4 percent in 1936-37. If natives were included, the disparity would be greater.

Regardless, however, of the basis of comparison that is used, the relatively unremunerative position of agriculture is clear. This has been the basic factor in the drift of population to urban areas and in the development of the Union's agricultural policy. Tariffs and subsidies, debt-remission schemes and subsidized freight rates, irrigation projects and market controls have all been used to improve the position of the farmer and stockman in South Africa. Through these devices the Government has sought to influence the trend of production, but the pattern of South African agriculture basically is determined by the opportunities offered, the limitations imposed by the resources of climate and soils, and the ability of the rural population to utilize those resources.

CLIMATE AND SOILS

From a narrow coastal fringe lying below 1,500 feet the land of the Union rises by steps to form the elevated plateau which constitutes a large part of South Africa's area. A small region of 16,000 square miles in the south has rain all the year around. The Western Cape, covering 50,000 square miles, has a moderate climate with most of the rain falling in the winter. The remainder, 406,000 square miles, has summer rainfall and a 6-month winter drought. The amount of rainfall declines westward as the distance from the Indian Ocean increases and the country flattens. As a result, the summer-rainfall area is largely semiarid, and only one-third of the whole Union receives more than 25 inches a year - the amount required for the successful production of the principal crops grown in the region. In addition to the seasonal nature of the rainfall, most of South Africa is subject to the intermittent droughts characteristic of semiarid regions. The rainfall is often in torrential thunderstorms, which result in heavy run-off. Evaporation is also high, and not all the rain that falls is utilized. Because of the lack of winter rainfall in most areas and the frost danger arising from the generally high altitude, the area of the winter crops is limited.

The Union's soils, in general, lack phosphates. Good soils exist but are patchy in occurrence. Erosion from duststorms in the dry winter and from the run-off of the summer downpours are serious problems in many areas. The irrigation value of the two rivers draining the plateau is so small that the irrigable area will not exceed 2,000,000 acres.[5]

Only in a few areas, then, does the proper combination of moisture, temperature, and soils exist for successful crop cultivation. Only 6 percent of the Union's area is cultivated, and, at most, no more than 15 percent appears likely ever to be cultivated. The greater part of the country is better suited for livestock farming; and, since conditions restrict the production of feedstuffs, the livestock industry is on an extensive basis. The gold and industrial mineral deposits of the Union are found in the area best suited for agriculture. That area - the High Veld of the Transvaal - is also blessed with a healthful climate; as a natural result of these advantages, it is the center of the Union's economic development.

RURAL POPULATION AND NATIVE AGRICULTURE

The nature of the rural population of a country is an important factor in the efficient utilization of its agricultural resources. While only 10 percent of the rural population of South Africa is European, that 10 percent controls most of the agricultural operations. About 13,000,000 acres of European-owned land are cultivated each year. The natives supply most of the labor on European farms and cultivate about 1,000,000 acres, mostly by primitive methods, on Native Reserves.

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[5] See reference cited in footnote 3.

As in the case of industry and mining, South African agriculture is dependent upon native labor. In 1936, the first attempt was made to obtain particulars on the distribution of the natives in various classes of areas. About 42 percent (2,962,000) of the natives in the Union lived in Native Reserves; that is, those parts of the country set aside for their exclusive occupation where they live under tribal rule and practice a peasant type of agriculture; and 31 percent (2,053,000) were on farms owned and occupied by Europeans.

The natives living on the Reserves are engaged almost exclusively in farming and pastoral occupations. According to estimates there were, in 1937, 4,000,000 head of large and 6,500,000 head of small stock on Native Reserves. Corn and grain sorghum (kaffir corn) are the staple crops. Small quantities of sweet sorghum, cotton, soybeans, and castor beans are produced on Native Reserves.

Natives residing on European-owned farms generally work either as casual day laborers or become "squatters" domiciled on the farm with their families. The "squatter" receives quarters for himself and his family and has the right to keep an agreed number of cattle and sheep and to raise crops on an agreed acreage of land, customarily about 6 acres.[6] South African production statistics generally include native production of crops on European farms but often exclude the production on the 1,000,000 acres of land cultivated in the Native Reserves.

THE PATTERN OF AGRICULTURAL PRODUCTION AND TRADE

Agricultural Areas

The farming areas of the Union are of a diverse character (see fig. 1).[7] The winter-rainfall area, encompassing the first four districts, constitutes the Capetown region. Deciduous fruit, vegetables, tobacco, wheat, and other winter cereals are the main crops. Dairying and sheep production are important.

The Indian Ocean coastal region, north and east of the Cape (districts 5 through 12), contains a number of intensely developed sections. The most important of these are the sugar belt, along the coast; the wattle-bark district which parallels the sugar belt; and the interior of Natal, where corn, wheat, subtropical fruits, cattle, and sheep are produced. Extensive livestock operations, native farming, and, in a few areas, fruit production characterize the agriculture of the remainder of this region.

The main corn-producing zone of the Union is in the Orange Free State and Southern Transvaal (district 16). The surrounding areas (districts 15, 17, and 19), though important for corn production, are transitional between the corn belt and the areas of extensive livestock operations that characterize the remainder of the Union.

[6] UNION OF SOUTH AFRICA DEPARTMENT OF AGRICULTURE AND FORESTRY, comp. FARMING OPPORTUNITIES IN THE UNION OF SOUTH AFRICA. New Ed. Union So. Africa, Dept. Agr. and Forestry. 130 pp., illus. Pretoria. 1936. (Published in collaboration with So. African Railways, Harbours and Airways Admin.)

[7] The areas shown on the map (fig. 1) are outlined in the reference cited in footnote 6. The area descriptions are from the same source supplemented by information from U. S. consular reports and TAYLOR, CLIFFORD C. AGRICULTURE IN SOUTHERN AFRICA. U. S. Dept. Agr. Tech. Bul. 466. 342 pp., illus. 1935.

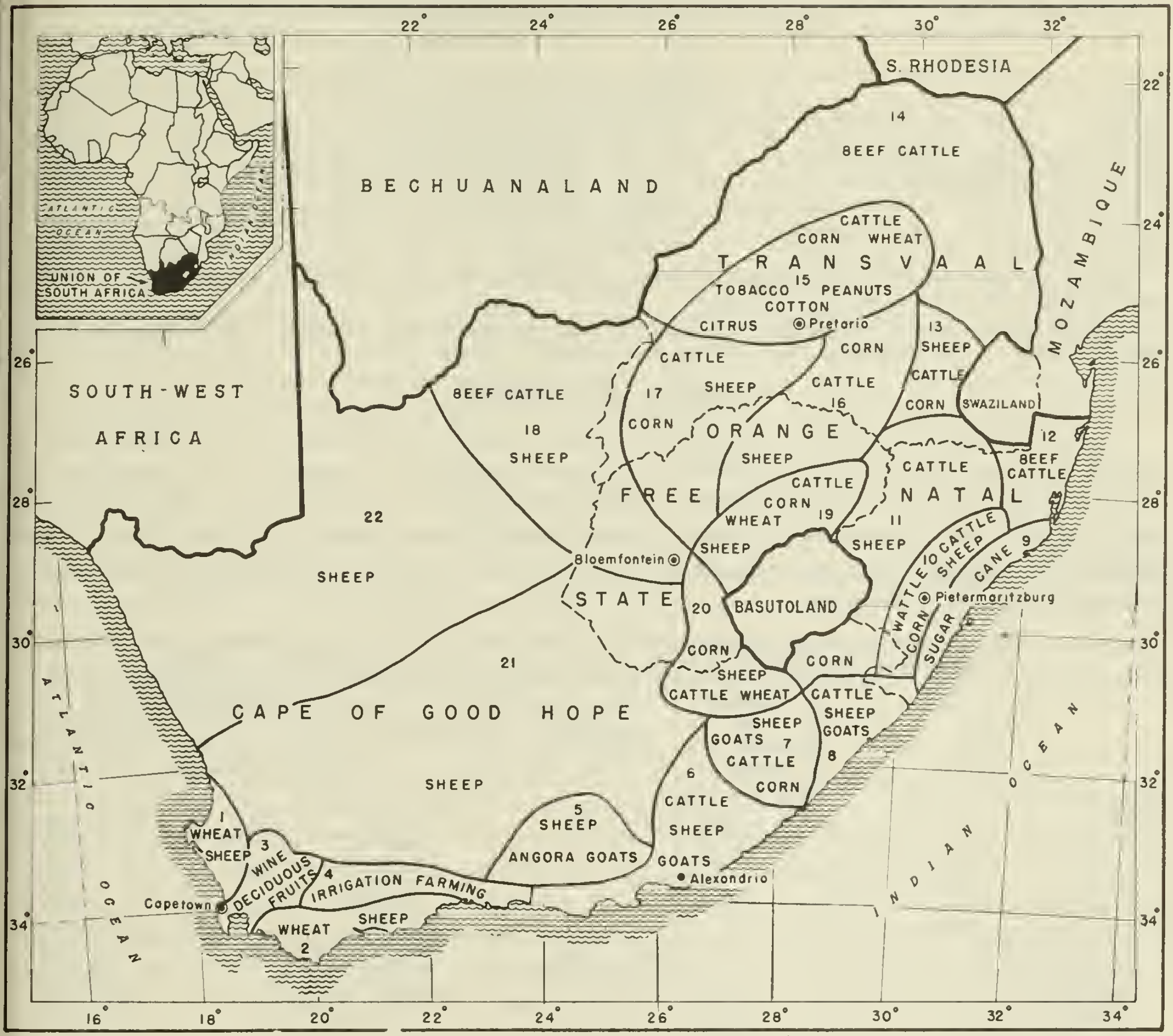

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FIGURE 1.-Map of the Union of South Africa showing areas of principal crop and livestock production.

Relative Importance of Commodities

In 1937 the Union Department of Agriculture and Forestry estimated the value of the average quantity of certain agricultural products marketed annually, using the average wholesale prices for 1935. While the results leave out of consideration those products produced for the farmers' home use, and while certain important products, notably vegetables, are omitted, the estimates serve (see table 3) as a general guide to the relative importance of the various products in the South African agricultural economy. Animal products constitute by far the most important source of income to South African farmers. Grain products, of which corn and wheat are the most significant, form the second most important source. The income from fruit and fruit products, including wine, brandy, etc., is third in importance.

TABLE 3.-*Estimated value*[1] *of the average quantity of certain agricultural products marketed annually in the Union of South Africa*

ITEM	VALUE	ITEM	VALUE
	1,000 dollars		*1,000 dollars*
Wool	42,680	Butter and cheese	7,954
Meat	27,645	Eggs and poultry	7,130
All fruits (including grapes)	24,250	Hides and skins	3,735
Corn (not including grain sorghums)	21,340	Wine, brandy, grape juice, etc.	3,686
Wheat	17,897	Wattle bark	2,716
Sugarcane	12,125	Tobacco	1,989
		Mohair	1,213

[1] Based on average wholesale prices, 1935; converted from S. A. pounds at average New York noon buying rate of $4.85 to the pound.

UNION OF SOUTH AFRICA DEPARTMENT OF AGRICULTURE AND FORESTRY. HANDBOOK FOR FARMERS IN SOUTH AFRICA. Ed. 3. 1,220 pp., illus. Pretoria. 1937. See p. 8.

Agricultural Surplus

At one time South African producers were hopeful of developing a large export market for many agricultural products. Natural conditions, however, are favorable to the economical production of only a few commodities. While in the pre-war years South Africa had an export balance in most agricultural products, that balance was maintained largely by a government policy which operated to give substantial export subsidies to the producers.

TABLE 4.-*Average agricultural production and foreign trade of leading crops, livestock, and livestock products in the Union of South Africa, 1934-35 to 1938-39*

ITEM	ACREAGE OR NUMBER (ON FARMS)[1]	UNIT OF PRODUCTION AND TRADE	PRODUCTION[2]	FOREIGN TRADE[3]		PRODUCTION PLUS OR MINUS TRADE BALANCE
				NET EXPORTS	NET IMPORTS	
Crops:	*1,000 acres*					
Corn	5,825	1,000 bu.	78,564	[4] 21,654	–	56,910
Wheat	1,873	" "	16,949	–	214	17,163
Oats	539	" "	7,115	[5] 19	–	7,096
Barley	77	" "	1,394	–	(6)	1,394
Grain sorghum (kaffir corn)	209	" "	4,978	11	–	4,967
Oil cake and meal	–	" "	[7] 10,168	–	[7] 17,233	[7] 27,401
Sugar, cane	357	short tons	450,483	205,634	–	244,849
Tobacco	37	1,000 pounds	19,007	–	2,392	21,399
Potatoes	87	" "	371,983	3,710	–	368,273
Citrus fruit	58	1,000 boxes[8]	5,152	3,466	–	1,686
Grapes	107	–	–	–	–	–
Table grapes	–	short tons	(9)	37,365	–	(9)
Raisins and currants	–	1,000 pounds	18,699	12,390	–	6,309
Brandy	–	1,000 pf. gal	3,481	71	–	3,410
Wine	–	1,000 gal.	7,177	1,828	–	5,349
Livestock and products:	*Thousands*					
Cattle (including dairy)	11,351	–	–	–	–	–
Beef and veal	–	1,000 pounds	[10] 456,000	13,000	–	443,000
Dairy cattle	[11] 2,155	–	–	–	–	–
Butter	–	1,000 pounds	45,014	3,412	–	41,602
Cheese	–	" "	11,947	1,829	–	10,118
Sheep	38,856	–	–	–	–	–
Wool	–	1,000 pounds	[10] 239,000	238,500	–	500
Mutton and goat meat	–	" "	[10] 198,000	1,000	–	197,000

[1] Native crop area not included though native production is included in most cases. [2] July-June crop year. [3] Calendar years 1935-39. [4] Corn meal included in terms of grain. [5] Including oatmeal and rolled oats in terms of grain. [6] Less than 500 bushels. [7] Production of peanuts converted to a cake and meal basis. The foreign trade figure includes peanuts and prepared oil meal and cake, but does not include the meal and cake equivalent of imports of 14,161,528 pounds of other oilseeds and nuts since the figure is of a miscellaneous nature. [8] Boxes of 42 pounds. [9] Not available. [10] Estimated from slaughterings and official average dressed weights. [11] European-owned dairy cows and heifers over 2 years old intended for dairy use.

From official yearbooks of the Union of South Africa and trade and shipping statistics.

The effects of the Government's agricultural policies upon the utilization of the country's resources were criticized vigorously in 1941 by the Industrial and Agricultural Requirements Commission:

> The main benefits were reaped by the farm crops - maize [corn], wheat and sugar - and to a much lesser extent by the livestock and fruit industries whose development would conform best to the natural controls governing our agriculture. Indeed, the assistance given so stimulated sugar and maize production that output increased and with it the export of surplus and export loss, so that further assistance was required. It was duly given. The net result of the stimulation of these and other crops has been a greater concentration on crop production, often by the cultivation of sub-marginal land with consequent deleterious effects on the country's soil resources. The expansion so induced has restricted the development of livestock farming which natural conditions favor.[8]

The pattern of production and foreign trade of agricultural products for the pre-war years reflects the influence of these governmental policies as well as the factor of basic resources. Wool and fruit products were the most profitable exports. Some imports of wheat were necessary despite the policy of assistance. The export of corn was erratic - fluctuating with the variations in yields caused by the vagaries of weather.

WARTIME PRODUCTION TRENDS

The stress of war has produced changes in the trend of production in South Africa that have long been advocated. There is now a greatly increased demand for foodstuffs by the domestic population. Many South Africans have felt that a more efficient agriculture could be created if more attention were given to the problem of increasing home consumption. Since the war has closed many of South Africa's export markets, substitute markets have been found at home. Production patterns, therefore, are being changed to meet the war-enlarged demands of the home market.

In 1941-42, the Union experienced one of the most disastrous droughts in recent times. As a result of the decrease in production and of the increase in consumption, there was a sudden reversal from the normal supply position, so that many products for which an exportable surplus formerly existed were in short supply. As a matter of fact, the situation changed to such an extent that during the 1942-43 marketing season, the only food products available for shipment from South Africa were deciduous fruit, for which no shipping space was available, and citrus and dried fruits. The 1942-43 crop was normal, on the whole, and the domestic supply picture improved.

THE COMMODITY-SUPPLY POSITION[9]

Wool. Wool is the largest source of farm income in the Union of South Africa. The Union is the fourth largest exporter of wool in the world and is second only to Australia in the production of fine-grade wools. The annual production of wool averages about 240,000,000 pounds. Until the outbreak of war an average of about 1,000,000 pounds of wool was manufactured in the Union each year. Under the impetus of wartime necessity, however, the textile capacity of the country has been expanded, and the use of wool by domestic manufacturers has greatly increased.

In 1940, the British Government agreed to purchase the entire South African wool clip for the duration of the war and one year thereafter under an arrangement similar to the wool-purchase agreements with Australia and New Zealand. Since the British

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[8] See p. 36 of reference cited in footnote 3.

[9] Most of the material in this section for recent years was derived from recent United States consular reports and UNION OF SOUTH AFRICA DEPARTMENT OF AGRICULTURE AND FORESTRY AND FOOD CONTROL ORGANIZATION. NEW CONDITIONS AND THE AGRICULTURAL INDUSTRY. Summary of report . . . for the year ended 31 Aug., 1942. Farming in So. Africa. 18: 1-45; 56; 79-100, illus.

Government is the sole purchaser of wool in South Africa, all trading is handled by the British control. At the beginning of the current wool year stocks equal to a full year's clip were stored in the Union.

Corn. Corn is the staple food of the South African native population; the principal cash crop, excluding animal products, of the farmer; the most important feed for livestock; and, in normal years, an important agricultural export. About 50 percent of the crop area of the Union is devoted to corn production. In pre-war years the production of corn averaged 78,600,000 bushels. Imports, mainly from adjoining areas, averaged 161,000 bushels and exports 21,800,000 bushels. About 60,000,000 bushels were available for consumption each year.

Under wartime conditions the domestic demand for corn has increased, and an average pre-war crop would barely satisfy present domestic demand. Conditions, therefore, became serious when the 1941-42 crop was reduced by drought to 58,357,000 bushels. The export of corn was stopped; feeding to livestock was first discouraged by a withdrawal of a special feeders' rebate on the price of corn, then limited by the allocation of supply to stock raisers, and finally, in February 1943, forbidden altogether; and allowances for human consumption were strictly rationed. Since corn, or corn meal, is the main, and often almost the only, food of the native population, near-famine conditions prevailed in many Native Reserves.

The 1942-43 crop was estimated at about 80,000,000 bushels, which should cover annual domestic needs and provide a small carry-over for the following year. Since the South African climate is erratic and the specter of the recent drought and famine is yet vivid in the minds of the people, the Food Control Organization is not likely to permit any exports of corn, unless small quantities are needed to relieve distress in neighboring African areas.

Wheat. While South Africa is not by nature suited to the economic production of wheat, the crop averaged about 17,000,000 bushels in the years preceding the war. About 600,000 bushels of wheat and flour in terms of grain were imported, and about 400,000 bushels were exported. Thus average consumption was just over 17,000,000 bushels per year. The Government has encouraged wheat production by providing high tariff protection and price supports, but South African varieties do not produce good baking flour, and some imports are necessary for mixing purposes each year.

Because of the short 1941 crop of 13,700,000 bushels, about 5,000,000 bushels of wheat were imported during the following season. The 1942 crop of 20,400,000 bushels was, however, sufficient to meet the domestic demand for 1943. The Government encouraged increased seeding for the 1943 crop because of the strong demand for all foodstuffs, and the 1943 wheat acreage is reported to be somewhat larger than that of 1942.

TABLE 5.-*Production of grain and potatoes in South Africa, 1934-35 to 1942-43*

CROP	AVERAGE 1934-35 TO 1938-39	1941-42	1942-43
	1,000 bushels	*1,000 bushels*	*1,000 bushels*
Corn	78,564	58,357	80,000
Wheat	16,949	13,733	20,400
Oats	7,115	5,766	6,405
Barley	1,394	1,906	1,643
Rye	821	668	802
Potatoes	6,200	6,307	5,888

From official sources and United States consular reports.

Other grains. The Union also produces grain sorghums, oats, rye, and barley. Most of the 5,000,000 bushels of grain sorghums (usually called kaffir corn in South Africa) annually produced in the Union is grown by natives. The crop is used for feedstuffs and, by the natives, for food. Foreign trade in grain sorghums is negligible. Oats, rye, and barley are produced primarily in the wheat belt. These crops likewise are grown for the domestic market, and the foreign trade in them is small.

TABLE 6.-*Livestock slaughtered at municipal markets, Union of South Africa, 1938-39 to 1941-42*

YEAR	CATTLE	SHEEP, GOATS, AND LAMBS	YEAR	CATTLE	SHEEP, GOATS, AND LAMBS
	Number	*Number*		*Number*	*Number*
1938-39 . . .	639,600	3,419,000	1940-41	764,900	4,185,000
1939-40 . . .	684,500	3,756,000	1941-42	832,600	4,618,000

UNION OF SOUTH AFRICA DEPARTMENT OF AGRICULTURE AND FORESTRY AND FOOD CONTROL ORGANIZATION. NEW CONDITIONS AND THE AGRICULTURAL INDUSTRY. Summary of report . . . for the year ended 31 Aug., 1942. Farming in So. Africa 18: 1-45; 56; 79-100, illus. See p. 34.

Meat. The Food Control Organization has been more concerned with the meat position than with that of any product except corn. Even in normal times only a small surplus of slaughter stock is produced, and the past 2 years have been far from favorable for the stock industry. Most of the areas producing slaughter stock have suffered severely from drought. Though droughts temporarily increase the supply of meat – as growers market stock for which feed is no longer available – the long-range effect is to reduce the numbers of breeding stock. Such a reduction has been already noted by the Union's Department of Agriculture.

The limitations on livestock production have been accompanied by a large increase in the consumption of meat. This increase, even more than any reduction in stock numbers, is the underlying reason for the meat shortage. Figures showing the slaughter at municipal markets (see table 6) indicate the trend and emphasize the fact that consumption has increased substantially each year since the war began.

The Department of Agriculture and the Meat Board found it necessary, beginning in 1941-42, to regulate the supply of cattle and sheep to principal markets, in order to ensure uniform distribution. All quantitative and weight restrictions on imports of stock from the neighboring territories of South-West Africa, Bechuanaland, and Swaziland were removed, and the Government acted to increase imports of meat from those areas by diverting livestock cars of the Government-owned railways.

Dairy products. The dairying industry has developed in South Africa to the extent that a small exportable surplus of butter and cheese normally exists. Consumption has increased, however, to record levels, and production has been limited by drought-stricken pastures and feed shortages, so that in 1942, except for consignments to other African ports, no butter, or cheese, was sent overseas. The consumption of butter, for the 12 months ended August 31, 1942, approximated 50,000,000 pounds, and of cheese 14,700,000 pounds. While these were record figures, the consumption of both butter and cheese would have been much greater had larger supplies been available.

The production of creamery butter in 1941-42 amounted to 39,792,000 pounds. Although more than 5,500,000 pounds short of the 1940-41 production, this output was larger than that of any pre-war year. The production of over 15,000,000 pounds of cheese in 1941-42 was a record and exceeded the previous year's total by 1,500,000 pounds. These results were particularly satisfying in view of the difficulties faced in securing sufficient feedstuffs. Since the 1942-43 crop season was one of normal crop yields, the feed situation was improved following the harvest.

Eggs. South Africa normally exports eggs to Europe. The scarcity of corn for feeding purposes and the disappearance of bran and pollard from the market, as a result of the prohibition of the baking of white bread, has aggravated the difficulties of egg production. At the same time local consumption has greatly increased; consequently, exports of eggs declined from 3,247,000 dozen in 1940 to 581,000 dozen in 1941, and the domestic market now absorbs all the eggs produced.

Potatoes. Potato yields have tended to decline during the war. This has been due to drought conditions, scarcity of fertilizers, and poor seed. The war has greatly interfered with the usual importation of seed potatoes. Therefore, inferior local supplies have been used, but the potato acreage has been maintained.

The demand for South African potatoes has shown a considerable increase from both foreign and domestic users. The neighboring areas of Portuguese East Africa, Northern Rhodesia, and British West Africa are dependent upon South Africa for potatoes. War shipments of potatoes to these areas have exceeded normal shipments. Sales figures (see table 7) indicate the upward trend of domestic consumption, which has been accelerated by requirements for ships' stores.

TABLE 7.-*Sales of potatoes in the larger markets of the Union of South Africa, and for ships' stores, 1938-41*

YEAR	PURCHASES ON LARGER MARKETS	PURCHASES FOR SHIPS' STORES	YEAR	PURCHASES ON LARGER MARKETS	PURCHASES FOR SHIPS' STORES
	1,000 pounds	*1,000 pounds*		*1,000 pounds*	*1,000 pounds*
1938	166,064	1,477	1940	186,395	4,892
1939	185,375	1,460	1941	193,415	20,395

UNION OF SOUTH AFRICA DEPARTMENT OF AGRICULTURE AND FORESTRY AND FOOD CONTROL ORGANIZATION. NEW CONDITIONS AND THE AGRICULTURAL INDUSTRY. Summary of report . . . for the year ended 31 Aug., 1942. Farming in So. Africa 18: 1-45; 56; 79-100, illus. See p. 37.

Hides and skins. The Union normally exports large quantities of hides and skins, mainly to the United States and the United Kingdom. Large contracts for army shoes and boots have been placed with Union footwear manufacturers, and the domestic demand for hides and skins has greatly increased. The total export has been maintained near pre-war levels, although the export of all wet, salted cowhides and of all dry, salted cowhides weighing 30 pounds or more is now prohibited. Consequently, foreign buyers may find greater difficulty in filling their needs in South Africa.

Tobacco. The acreage and production of tobacco in the Union have been steadily increasing since 1935-36. Production during the 5 years immediately preceding the war averaged 19,000,000 pounds, of which Turkish-type tobacco amounted to less than 1,000,000 pounds. The total 1942-43 crop was estimated at 25,200,000 pounds, the average yield per acre being only fair. Most of the imports of leaf tobacco are from the Rhodesias. Northern Rhodesia has an annual fixed quota of 400,000 pounds, whereas Southern Rhodesia's duty-free quota varies from year to year. Because of increased consumption and exportation of Union tobacco, Southern Rhodesia's quota for flue-cured tobacco was fixed at 3,000,000 pounds for the year ended May 31, 1942.

Citrus fruits. More than two-thirds of the annual production of citrus fruits is normally exported from South Africa. The British market is usually the largest customer. Since 1939, however, shipping space allocable to citrus fruits has been very low. During 1941 the British Ministry of Food took all the oranges for which space was available; yet, only 38 percent of the orange export crop could be lifted. Exports of oranges fell from an average of 8,437,000 boxes of 42 pounds during 1935-39 to 1,840,000 in 1941, and grapefruit exports showed a similar decline.

The South African Citrus Board has worked earnestly to expand the domestic consumption of the surplus citrus production. Charitable institutions, schools, hospitals, and social-welfare agencies may purchase fruit from the Board at greatly reduced prices. Early in 1943 the Board established its own retail outlets in Cape Town. Since producers received better prices and consumers paid less and for that reason purchased more (77 percent more than in the same period in 1942), the experiment was regarded as a success. Consequently, retail outlets owned by the Board have been opened in other South African cities. The increase in local demand, however, has not absorbed all the surplus available.

Deciduous fruits. With the outbreak of war, the South African deciduous-fruit industry was faced with a crisis unprecedented in its history. Prior to the war growers of practically all types of deciduous fruit were dependent on overseas markets, principally in the United Kingdom, which normally took about 30 percent of the apple crop and three-quarters of the pear crop. When in 1941 the shortage of shipping space stopped all overseas shipments of fresh fruit - except citrus needed for its vitamin C content - South African producers obviously could not carry on without government assistance. For that reason, the Government, through the Deciduous Fruit Board, entered the market and purchased surplus fruit supplies. Arrangements were then made to increase sales of fresh fruits in local markets and to divert remaining supplies to canneries, dehydration plants, jam-manufacturing plants, and wineries.

Grapes are the most important of the deciduous fruits exported. Production is concentrated in the winter-rainfall area around Cape Town. Many varieties are grown, and before the war table grapes, raisins, sultanas, currants, brandies, and wines were all exported. The luxury trade in table grapes in the London market was entirely cut off by the war, but dried vine fruits have been in demand by the British Ministry of Food, and much of the surplus grape production was diverted to this channel.

As already stated, before the war approximately 75 percent of the pear crop was exported to the United Kingdom. Under war conditions, in order to prevent total chaos in the market, the Deciduous Fruit Board in 1941 began purchasing the entire crop. It has succeeded in disposing of the production and expects the alternative outlets that it has opened to provide a permanent increase in the market for Union pears.

During and following the first World War apple orchards expanded. Many were established in areas not suited to apple production or with varieties not adapted to South African conditions. After about 25 years of experience the areas suitable for apples are now better known. Investigation by private growers and by the Department of Agriculture and Forestry has shown that there are excellent apple-growing regions, capable of considerable extension, at higher elevations in the Cape Province, where in winter relatively cold temperatures prevail.

The chief stone fruits produced in South Africa are plums, peaches, apricots, and nectarines. The 1942-43 plum crop of 6,720 short tons was all handled by the Deciduous Fruit Board. About half was sold fresh, and about half was made into jam. Peach and nectarine production was low in 1942-43, the total crop being estimated at 7,840 tons. Slightly more than 1,120 tons were dried, and the remainder was sold fresh. The 1942-43 apricot production was estimated at the unusually large figure of 16,800 tons. About 6,700 tons were used for drying, and the remainder was canned.

The production trend of most fruits has been stable during the war, although the production of both apples and plums has increased about 20 percent. With normal markets almost completely shut off, the Government is paying approximately £350,000 ($1,393,000 at current rate of exchange) yearly in subsidies to keep the industry going, and the planting of new orchards has reached an unprecedented rate. The South African fruit grower is anticipating an expanded market in the post-war period.

Dried fruit. South Africa is normally an important exporter of raisins and currants. Its annual pre-war production averaged 18,700,000 pounds, of which 12,400,000 pounds were exported. In 1941-42 production was estimated at 22,300,000 pounds, indicating a sizable surplus for export. The production of other dried fruit was placed at 4,000,000 pounds in 1940-41 and at 8,100,000 pounds in 1941-42. The British Ministry of Food purchased most of the exportable surplus of all dried fruits.

THE CONSERVATION OF AGRICULTURAL RESOURCES

One of South Africa's greatest problems, in time of peace or war, is to prevent the wastage of soil resources. Most of South Africa has climatic conditions that subject the land to widespread damage from both water and wind erosion. The low annual rainfall of most of the Union, the seasonal winter dry period, and the intermittent droughts produce conditions that lead to duststorms and extensive wind erosion. The nature of the rainfall - much of which falls in torrential thunderstorms - causes large-scale and serious water erosion.

Prevailing methods of cultivation and of pasture and stock management have also added to the problem of erosion. The cultivation of crops - particularly of corn - has been extended into submarginal areas, with harmful effects upon the country's soil resources. In the grazing areas the pasture (veld) land has been depleted through overgrazing, veld burning, and other mismanagement practices.[10] A shortage of fertilizers, which are needed by most South African soils, has intensified the need for cropping practices that will retain the soil and maintain its fertility.

The Union Department of Agriculture and Forestry has long conducted research and educational activities concerning land utilization and soil conservation. In addition to these activities, the Department conducts action programs to prevent soil erosion. The most important of these have been the financial aids given by loan and subsidy for the construction of dams, terraces, or other antierosion works.

Under the Veld and Forest Conservation Act the Government is authorized to appropriate areas which are so badly eroded that only expenditures of national funds can restore them to productivity. The powers given by this Act have not yet been exercized on a large scale and, since farm opinion in South Africa is opposed to any trend toward the nationalization of landholdings, are not likely to be. In areas of severe erosion, however, the use of the powers is considered necessary and may be extended.

The limits imposed by nature on agriculture in South Africa are now recognized. The present pattern of land utilization is widely criticized, and changes in the pattern or in the methods of crop and livestock production may be necessary for the preservation of soil resources in many areas. Whether South African farmers produce for export or for the home market, the improvement of production practices and the conservation of arable and range lands may be expected to be an essential feature of the Union's agricultural policy.

The United Nations Conference on Food and Agriculture envisaged an expanded food and nutritional program in each of the United Nations. The South African home market for food products has greatly expanded during the war and is capable of further expansion. If South African production is directed toward the home market, marked changes may be made in the pattern of production. Many of these changes could well be incorporated into a conservation program for the Union.

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[10] See LEPPAN, H. D. THE AGRICULTURAL DEVELOPMENT OF ARID AND SEMI-ARID REGIONS. . . . 278 pp., illus. [Johannesburg.] 1928. See also reference cited in footnote 3, and for a more specific discussion of the erosion of pasture lands see BOTANICAL DEPARTMENT, UNIVERSITY OF WITWATERSRAND. REPORT ON ANTI-SOIL EROSION AND GRASSLAND IMPROVEMENT GRANT FOR RESEARCH 1942-43, etc. 51 pp., illus. Johannesburg. 1943. [Mimeographed.] *In* DAY, SAMUEL H. LAND USAGE AND PROTECTION IN SOUTH AFRICA. U. S. Cons. Rpt. 47, 1 p. July 27, 1943. [Hectographed.]

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THE NEW FLAX INDUSTRY OF PERU . . . . .

By Elizabeth P. Tappy*

Peru undertook the cultivation of fiber flax on a commercial scale for the first time a little over 4 years ago. The project had an auspicious beginning, motivated not only by national enthusiasm for a new enterprise but also by urgent wartime needs of the United States for a strong and durable thread fiber. Unfavorable returns in 1941 and 1942 made government intervention necessary. The United States has also come to the aid of the industry through the Commodity Credit Corporation. Future prospects now indicate that flax may assume a permanent role in the Peruvian economy.

HISTORY OF FLAX

The flax plant produces a fiber that for centuries has contributed in no small measure to the clothing of the human race. Four or five thousand years ago flax was grown in Mesopotamia, Assyria, and Egypt. From Egypt, the cultivation of flax moved on to Palestine and Greece. From Greece this industry spread to Carthage, Marseilles, and then to Rome, where the citizens adopted linen as their usual wearing apparel. When Rome fell, many of the arts and handicrafts were obliterated, but in some way the spindle and distaff escaped, and flax continued to supply material for clothing (*2*, pp. 21, 22).[1] The belief is that flax was introduced into Northern Europe by the Finns, later into Western Europe by the western Aryans, and to some extent by the Phoenicians, and into Hindustan by the eastern Aryans after their separation from the European Aryans (*6*). Finally, flax cultivation spread to the Western Hemisphere.

THE NATURE OF THE PLANT

The flax plant, *Linum usitatissimum*, is a hardy annual of from 2 to 4 feet in height. It has slender tapering roots, which penetrate deeply into the soil, and its upright stem or stalk is covered by a greenish bark, which contains the fiber. Desirable stems of fiber varieties of flax are 3/32 of an inch in diameter with numerous alternate sessile leaves, narrow and lance-shaped. The cluster of flowers borne on the tops of the branches are usually sky blue but in certain varieties are white or pink. They produce bolls or capsules containing in most cases five cells, each of which may contain two flat seeds, brown in color. The stem of the plant has three distinct parts: (1) The outer skin, bark, cuticle, or epidermis, covering (2) bundles of filaments held together by a glutinous substance and running parallel the length of the stalk, and the (3) thick woody material in the center of the stalk (*2*).

Two types of flax may be cultivated; one produces oilseed from which linseed oil is derived, with linseed cake as a byproduct, and the other produces long fiber strands from which textiles are manufactured, with tow fiber as a byproduct. The fiber obtained from the second type lends itself readily to conversion into fabrics by machinery or by hand. It is soft in texture and commonly used in the production of linen thread, fabrics, rope, cord, fishlines, and other textiles requiring fineness, durability, and strength. In wartime it is used for webbing cord for parachute-harness construction and for thread for sewing leather goods and stitching airplane fabrics.

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* Office of Foreign Agricultural Relations.

[1] Italic figures in parentheses refer to Literature Cited, p. 72.

The tow consists of short lengths of fiber removed in the scutching process and combed out in hackling. When properly cleaned it may be used for twines, canvas, and towelling. Low grades of tow are used in the manufacture of paper.

CLIMATE AND SOIL REQUIREMENTS

Fiber flax is usually thought of as a Temperate Zone crop favored by a cool and moist climate. Actually, it is grown from the neighborhood of the Tropics to the polar circles. In recent years the largest quantities of commercial fiber flax have been produced in the Eastern Hemisphere, with Russia the largest producer. Flax is also grown for fiber and seed in the Western Hemisphere, in regions around the Great Lakes in the United States and Canada, for seed in Argentina and Brazil, and for fiber in Chile and Peru, with Peru the leading producer of fiber flax in the American republics to the south.

The soil best suited to flax is a deep loam with clay subsoil (*7*). Coastal regions, where atmospheric moisture is high due to proximity to an ocean, have favored plant growth, and fertile, well-drained alluvial deposits of rivers often give good results. Flax may be successfully grown on other soils, however, in regions where climatic factors are favorable if proper cultural methods are followed.

Peru lies entirely within the Tropics, but the climate of its central coastal area, due to certain oceanic and atmospheric conditions, is well suited to the cultivation of flax. The plant also grows well in the Peruvian valleys from Trujillo in the north to Pisco in the south. The Department of Lima on the coast appears to be the most favorable region because of high humidity and lower temperatures.

DEVELOPMENT OF THE FLAX INDUSTRY IN PERU

Early Experimental Plantings

With the exception of a few sporadic and unsuccessful attempts at flax growing in the Sierra over a number of years, no scientific experiments with this crop were attempted until 1933. The La Molina Agricultural Experimental Station then began to work with the crop, and, because of the favorable results obtained, the authorities decided to promote cultivation on a large scale (*1*). A commission was appointed in 1939, and an official campaign to promote flax growing got under way with 290 acres sown that year in the Pativilca and Supe Valleys with pure-pedigreed seed imported at government expense from Sweden. The plantings made in the Pativilca Valley, where its principal crop, cotton, had suffered a succession of failures, were under the careful supervision of the La Molina staff. The outturn was highly satisfactory, and the flax was well received in the United States, where the prices had advanced considerably as a result of the loss, when the war began, of flax supplies normally obtained from the Baltic and Low Countries of Europe. With the stagnation of the cotton market in Peru, resulting from war conditions, many Peruvian cotton farmers turned to flax as a more profitable cash crop.[2] Subsidies for planting and harvesting operations were furnished by the Government. Retting pools and a scutching plant equipped with Belgian machinery were also built and leased at low costs to the farmers (*1*).

Results of Campaign to Promote Production

The success of the 1939 plantings was so encouraging that in the following year the area sown in the Pativilca Valley was almost quadrupled. Trial plantings also were made in the Cañete Valley, where insect pests and other adversities had caused heavy damage to the cotton crops. Although the yield per cultivated acre dropped somewhat, the 1940-41 crop on the whole was good. The price of fiber had risen from 25 cents (United States currency) per pound in 1929 to 40 cents per pound in 1941. Cotton yields in certain valleys had fallen off alarmingly, and prospects of European markets were more uncertain than ever. Consequently, in 1941 about 37,000 acres were planted to flax, chiefly in Pativilca, Cañete, and the surrounding valleys (*1*).

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[2] ROBINSON, BRITTAIN B. FIBER PLANTS IN PERU. *In* Rpt. on Agr. Survey of Peru. U. S. Bur. Plant Indus. 43 pp., illus. [n. d.] [Mimeographed.]

Returns from the 1941 plantings were, however, disappointing; the average yield per acre fell considerably, and the cost of production rose to the point where little profit was realized. Part of the trouble was attributed to scarcity of seed at the proper time of planting. Local seed from the previous year's crop could not supply the demand, and the price rose to 56 cents per pound. Seed ordered from the United States arrived too late for the early sowing; late sowings of this and of seed from the earlier local plantings produced large quantities of inferior flax and resulted in an accompanying increase in insect pests and disease.

By May 1942, nearly 2,000 short tons of fiber and tow that could not be moved because of lack of shipping space had accumulated in Peruvian ports. This amount was expected to increase to more than 3,000 tons of fiber and around 5,000 tons of tow by August, with a new crop to be harvested in October.[3] United States buyers were unable to obtain import licenses and were therefore forced to withdraw from the market. Since there were no other purchasers, only the flax already contracted for could be exported, and large stocks were left in the hands of producers.

The United States supply of flax, however, had become inadequate for wartime needs; the United States therefore thought it advisable to come to the aid of the Peruvian flax industry and help keep it on a stable basis.

Agreement with United States

An agreement concluded on May 23, 1942, between the Commodity Credit Corporation and the Peruvian Government for the purchase of flax grown in Peru was of mutual benefit to both countries. The agreement provided in substance that the Commodity Credit Corporation would buy from sellers in Peru all scutched flax conforming to grades determined by samples, not in excess of 4,000 long tons (4,480 short tons) offered within each 12 months from September 15, 1942, to September 14, 1944. Thereafter, pending an armistice with the Axis Powers, the Corporation has the sole option of purchasing any additional flax produced. Beginning December 1, 1942, the Corporation agreed also to buy from sellers in Peru all flax tow not exceeding 3,000 long tons (3,360 short tons) in each 12-month period. On the other hand, Peru agreed to assure deliveries of the quantities stipulated to the Corporation and to prohibit exports of flax or tow except to that Corporation.

The Commodity Credit Corporation further agreed to give all possible aid to the Peruvian Government for acquiring processing plants and for securing shipping space for products included in the Agreement. Purchases were to be made directly from the grower rather than from brokers, dealers, and other intermediaries, who formerly had gained most of the profits.

Standards were approved and a sales contract drafted. The prices stipulated for line fiber ranged from 55 United States cents per pound, f.o.b. Peruvian port, grade A, to 40 cents per pound, grade F (1942 crop); from 54 cents, grade A, to 39 cents, grade F (1943 crop); and from 53 cents, grade A, to 38 cents, grade F, for crops thereafter.

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[3] HINKE, FREDERICK W. ANNUAL ECONOMIC REVIEW - PERU. U. S. Cons. Rpt. 32, 91 pp. 1943. [Hectographed.]

The prices stipulated for fiber tow ranged from 16 United States cents per pound for plucking tow, f.o.b. Peruvian port, to 8 cents per pound for scutching tow (not equivalent to Canadian T.T.).

The bulk of Peruvian tow[4] that was being produced from the 1942-43 crop did not conform to these types; therefore the Commodity Credit Corporation proposed standards of a new classification, which were adopted by common agreement with the Flax Commission. These, with prices that are now in force, include the following specified grades: No. 1 scutching tow and plucking tow, 18 cents per pound; No. 2 scutching tow, 13 cents per pound; and No. 3 scutching tow (T.T.), 10 cents per pound.

The major part of tow originally produced in Peru was of poor quality, hardly meeting the lowest Peruvian standard grade, or "scutching tow T.T." To attain the standards of the first two grades, the tow had to be subjected to a cleaning process to eliminate impurities, during which it lost considerably in weight. The cleaning process was costly, the more so dependent on the amount of foreign matter to be removed (*3*).

In the latter part of August 1943, Peruvian delegates were sent to the United States to confer with the Commodity Credit Corporation about certain features of the flax agreement particularly in regard to classification of fibers and disposal of tow supplies. A satisfactory agreement was reached, and the Peruvian representatives recommended its acceptance by the Peruvian Government.

The 1942-43 Harvest

For the 1942-43 harvest the hope was that a better yield in quantity and quality might be obtained by limiting the planting to the early season only and by employing good seed. A rust, *Melampsora lini*, appeared, however, and unusually damp weather intensified its attacks to such an extent that many fields were abandoned and left unharvested. In other fields flax stalks had not grown well; density was low as was the corresponding yield in weight. While the fiber from the previous year's crop was reported by the leading manufacturers who had bought it to be excessive in length, between 40 and 50 inches, and not a commercial product for spinners (*8*, p. 11); results of the 1942-43 crop were just the reverse, since it was impossible to obtain a fiber of 22 inches minimum length which was required in the agreement (*5*).

The yield of fiber per acre was estimated at 121 pounds, or only 75 percent of that obtained in the 1941-42 season, 63 percent of that in 1940-41, and only 50 percent of that in 1939-40. The low yields of flax were accompanied by poor fiber yields, the short stalks producing large quantities of tow and little long fiber. Furthermore, the cost of producing the 1942-43 crop was so high that an actual loss was sustained.[5]

The 1942-43 output of fiber was estimated at about 2,425 short tons (see table 1) with exports for the first semester of 1943 amounting to 1,656 tons of fiber and 169 tons of tow; all the fiber and 156 tons of tow were shipped to the United States.[6]

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[4] Clean tow, of good grade is not differently constituted from long or "line" fiber but is made up of a mixture of tangled fibers of different lengths to which cling small amounts of woody material. In order to be usable, tow must be subjected to a cleaning process, the amount of cleaning determining its value by its degree of cleanness, length of fibers, and its resistance.

[5] In addition to the general costs of cultivation, fertilizers, land rent, and processing fees, most producers also bear the expense of fire insurance on flax stored at mills awaiting processing. Because of the inflammable nature of flax products, fire-insurance rates are high and regulations exacting.

[6] CAMILLONI, HUMBERTO. MONTHLY ECONOMIC REPORT - AUGUST 1943. U. S. Cons. Rpt. 372, 8 pp. Aug. 24, 1943. [Hectographed.]

TABLE 1.-*Flax acreage and production*

ITEM	1939-40	1940-41	1941-42	1942-43[1]	1943-44[1]
Acreage under cultivation (acres)	675	2,629	37,105	39,148	27,580
Total crop per acre (pounds) . . .	3,165	2,825	2,492	2,454	-
Percentage of fiber from total crop	7.1	6.8	4.8	7.0	-
Percentage of tow	9.2	10.0	10.4	11.5	-
Relation of fiber to uncleaned tow	1 - 1.3	1 - 1.5	1 - 2.1	-	-
Fiber per acre (pounds)	239	192	161	121	-
Total output of fiber (short tons)	81	252	2,986	2,425	-

[1] Preliminary figures from the United States Embassy at Lima.

The remaining tow went to Cuba and Chile. Exports of flax during 1942, by valley of origin and country of destination, show (see table 2) that the Canete Valley was the most important source of flax shipments; during January-June 1943, however, exports from Lima forged ahead. The United States was by far the most important customer.

TABLE 2.-*Exports of flax, by valley in which produced and country of destination, 1942 and January-June 1943*

PERIOD AND VALLEY	UNITED STATES		CUBA	CHILE		
	LINE FIBER	FIBER TOW	FIBER TOW	LINE FIBER	FIBER TOW	PAPER TOW
1942:	*Short tons*	*Short tons*	*Short tons*	*Short tons*	*Short tons*	*Short tons*
Pativilca, Barranca, and Supe	562	814	-	17	1	-
Huaura-Sayán	134	-	-	-	-	1
Chancay	130	80	-	-	-	-
Lima	780	430	-	-	112	-
Mala	9	(1)	-	-	-	-
Cañete	857	1,198	-	-	2	-
Chincha	138	114	-	-	-	-
Ica	(1)	-	-	-	-	-
Huarmey	1	-	-	-	-	-
Total	2,611	2,636	-	17	115	1
January-June 1943:						
Pativilca, Barranca, and Supe	372	137	-	-	-	-
Huaura-Sayán	20	-	-	-	-	-
Chancay	45	-	-	-	-	-
Lima	579	15	-	-	-	-
Mala	14	-	-	-	-	-
Cañete	504	4	2	-	11	-
Chincha	96	-	-	-	-	-
Pisco	16	-	-	-	-	-
Huarmey	10	-	-	-	-	-
Total	[2]1,656	156	2	-	11	-

[1] Less than 1,000 pounds. [2] Exported by the Commodity Credit Corporation.

Compiled from ALGODÓN, BOLETIN DE LA CÁMARA ALGODONERA DEL PERÚ. 3: 315; 524.

Prospects for 1943-44

Indications are that the yield of fiber from the 1943-44 crop will be much greater than that obtained in 1942-43, despite the fact that the area planted to flax this year, totaling 27,580 acres, appears to have been reduced by 30 percent from that of last year.[7] Latest reports are that growing conditions have been more favorable than in the previous season and that only small attacks of rust have occurred in certain districts.

Of the total area planted to flax in 1943, about 23,132 acres are in the coastal valleys and about 4,448 acres in the Sierra. The reduction in the valleys of Pativilca,

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[7] GREENUP, JULIAN. FLAX - 1942 PRELIMINARY ESTIMATES. U. S. Cons. Rpt. 7659. 1 p., illus. Aug. 19, 1943. [Hectographed.]

Cañete, and Lima, where flax was first cultivated, amounts to about 40 percent of the last planting in 1942. On the other hand, flax acreage has been extended in other valleys to the north and south and also in the Sierra (*4*). Introduction of a crop of as high economic density as flax has proved favorable to the agriculture of the Sierra region, since flax is capable of yielding much higher profits than the traditional crops, such as potatoes, corn, and barley. These latter crops have exhausted the soil; and, on account of the cost of fertilizer, fields have been allowed to lie fallow in order to regain their fertility. Flax, grown successfully, can warrant the use of fertilizer, thus eliminating the necessity of allowing the land to lie idle. A larger area can therefore be devoted to annual food crops to increase food production (*4*).

Early in 1943, the Commission for the Development of Flax Cultivation called meetings of flax producers in the individual valleys for the purpose of formulating plans to be followed in the 1943-44 flax campaign. As a result of these meetings, several measures were adopted that may remedy many of the industry's previous ills; namely, limitation of the planting season, renewal of seed (bringing them from the Sierra if possible), crop rotation, fertilization (particularly of lands previously planted to flax and in new fields when considered necessary), and the double-retting of straw in order to increase the fiber yield and quality.

Methods of Cultivating and Processing

In Peru, as elsewhere, for the cultivation and processing of flax a complicated process is necessary. Technical knowledge and skillful handling are required if a finished commercial fiber is to be obtained.

Irrigation. Since irrigation is essential for all crops on the coast of Peru, flax is grown under irrigation in this region. The proper time and method of irrigation in Peru have been matters of controversy. In northern European countries, flax is planted in the early spring and, due to the cool weather, the seeds germinate slowly and the seedling plants are slow in developing. The temperature in Peru at planting time is much higher and results in rapid development in the early seedling stage, plants sometimes reaching a foot or more in height a month to 6 weeks after planting. Experts believe that by irrigating the seedbed before planting and by not again applying water until the plants show an actual need for it, the growth in height may be checked somewhat and a better fiber developed.[8]

Farmers in Peru have been instructed not to irrigate after the flax is in flower, because watering at that time not only prolongs the flowering season and subjects the plants to disease but may result in a second growth considered injurious to the quality of the fiber. Instead, scientists recommend that the last irrigation be applied just before the flowering begins, since sufficient moisture will be retained to mature the plants properly.[8]

Some Peruvian flax growers dig large, deep ditches after sowing. In addition to the space used for the ditch, a foot or more of ground is covered by the soil turned out of the ditch. Estimates reveal that in a field of this sort at least 15 percent of the area of the field is occupied by the irrigation system, and the use of a mechanical puller is practically prohibited. Furthermore, the flax near the edge of the ditches grows coarsely and does not mature at the same time as that in the remainder of the field. Other growers prepare shallow ditches and ridges before seeding. This method has produced much better results as to quality and yield, and a mechanical puller could be operated in the fields.[8]

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[8] See reference cited in footnote 2.

Fertilizer *(8)*. During the early years of flax culture in Peru, fertilizer was not generally used, and its influence on the quality of fiber had not been determined. Recent experiments in six valleys proved that its use had caused a marked increase in production at comparatively little expenditure. In certain other valleys, where the crop has not repeated itself, the use of fertilizer might be unnecessary; therefore the Flax Commission recommended that the farmer determine the fertility of his soil and use fertilizer only where needed and in fields repeating the crop.

The requirements of the whole plant are considered in calculating quantities of fertilizer materials, since the entire plant is pulled up by its roots. The fertilizer requirements of an acre of flax, according to soil-science investigations, are as follows: Nitrogen, 49 pounds; phosphoric acid, 7 pounds; potash, 22 pounds; lime, 11 pounds.

A soluble and easily assimilable fertilizer is recommended by scientists, so that the plant will receive the benefits rapidly. Farmers are warned against using an excess of nitrogen, because lodging, as a result of excessive vegetation, may result and fiber will be of poor quality. The phosphoric acid aids in early ripening, and the potash is a useful element, contributing largely to an increase in the proportion of fiber in flax as well as toits strength. Since Peruvian soils are slightly alkaline, little lime is necessary.

Sowing. Soils for flax beds are prepared either dry or moist, after which the seed are sown. If a dry soil has been prepared, it is irrigated immediately after sowing; and, if a moist seedbed has been prepared, it is not irrigated for nearly 3 weeks. Planters do not yet know which method gives the best stand and yield. In cases where the soil was first irrigated and then plowed moist and planted immediately, results were satisfactory. If the soil is allowed to dry for 2 or 3 days after irrigating and then the seed are broadcast and covered with a harrow, roller, or float, as is the usual custom in Peru, they may not be uniformly covered, and an uneven stand may result. Observers have recommended drilling the seed rather than broadcasting them to ensure a more uniform growth.

The quality of seed used is of major importance in sowing. In many cases plantings have failed because of the use of seed of low germinating power, or by the admixture of weed seeds. The seeds of Swedish origin planted in 1939 were of excellent quality and gave splendid results, whereas much of the seed used thereafter produced stems of uneven height and thickness *(1)*.

Another important factor is sowing at the right time of the year. Flax is grown in Peru as a winter crop, approximately from May to August. Sowings made too early on the coast suffer from the effects of late-summer heat and from the ripening of the crop in the coldest and wettest months. This delays the drying of the stems and starts a premature retting, all of which injures the fiber. Sowings made too late are subject to attacks of rust and other diseases, the growing season is shortened, and ripening is hastened by the rise in temperature at the beginning of the summer season. These conditions also give a poor yield *(1)*. The practice now is to shorten the growing period so as to limit the time in which rust and other ailments can make headway.

Careful leveling and preparation of the land are also essential as is the use of a requisite amount of seed per acre for sowing, since thin sowings produce thick, branching stalks and dense sowings produce weak stalks *(1)*.

Harvesting. In some countries where fiber flax is grown commercially mechanical pulling machines are used for harvesting flax. If the stems were cut as corn or other fodder, a square blunt end would be left on the fiber; some suggest that this is detrimental to its spinning qualities. Harvesting in Peru is usually done by hand by the Indians from the Sierra. Hand pulling is slow and laborious work, requiring from 17 to 25 Indians per acre of flax a day. The rate of pay per person for this work amounts to $2.75 or $3.75 per acre. A mechanical pulling machine was used experimentally in Peru at one time but met with little success, because, for one reason, of the deep irrigation ditches in the fields over which it had to travel.[9]

After flax is pulled, it is spread on the ground to dry. The laborers place the flax in parallel rows with all the heads in the same direction. This facilitates turning the flax in the process of curing, should turning be necessary. The quality of flax may be reduced if left too long on the ground exposed to the hot sun. In fact, flax need not be completely cured before tying into bundles and shocking.

Threshing. Removal of the seed takes place after the flax is cured. This process is more difficult during the winter months in Peru than it is in other flax-growing countries. The humidity is so high that, when roller-type threshers are used, the crushed bolls cling to the straw and are hard to remove. Seeds are removed in Peru by both hand and mechanical ripples. The hand ripple is a coarse comb made of square iron spikes or pins set in a wooden stock. The comb is attached to the end of a wide board and supported on a rest. The operator splits up bundles of flax into handfuls and strikes them over the comb drawing the straw through the teeth. The flax then is retied into bundles and is ready for the retting process.

Retting. Retting of flax straw is a process that renders soluble the gummy matter that binds the fiber around the stem so that the fiber may be separated from the woody material with the minimum breakage and loss of fiber. This process is really a complicated form of fermentation brought about by soaking the flax in water or exposing it in some way to moisture (7, p. 32). Tank-retting (placing the flax in empty vats and then letting in the water to submerge the bundles, with a wooden frame or ropes fastened over the top of the flax to prevent its rising due to its own buoyancy during the course of fermentation) is practiced in all the flax mills in Peru.[9] After the straw has been retted, it is stacked in bundles and left to dry in the sun.

Breaking and scutching. When sufficiently dry, the straw is treated in a breaking machine, which consists of several pairs of fluted rollers that break the woody part of the stalk into small pieces without harming the fiber. The fiber is then scraped or beaten to remove any small pieces of wood clinging to it, a process known as scutching (7, p. 50). This may be done by hand, but machines are used in Peru. Machines have, however, given much trouble partly because their capacity was overrated and partly because of the inexperience of operators. Dissatisfaction has also resulted over the high ratio of tow fiber to line fiber. Some producers attributed these difficulties to the machines themselves.[9] Consequently, several machines reported to have given good results in Canada and the United States were ordered and installed. The improvement then noted may not have been due entirely to the new machinery but also to the gain in experience by the operators.

Diseases and Pests

Flax planted for the 1939-40 and 1940-41 seasons was comparatively free from diseases and pests, largely because the crop was new and was planted on a small scale. Over a period of 4 years, however, the natural enemies of flax had time to make their appearance and to become a serious menace to the expanding industry. Among the factors influencing the growth of these enemies were the natural multiplication of pests, uncontrolled importation of seed, unscientific methods of cultivation, insufficient preparation of the soil, and repeated plantings in the same fields.

[9] See reference cited in footnote 2.

Two fungus diseases have attacked the flax crop. The first, *pasmo (Phlyctaena linicola)*, occurred in the Cajamarca area of the Sierra. Since it did no damage elsewhere, it was attributed to the type of seed used, and the belief is that it has been controlled by a change of seed. The second, the rust *Melampsora lini*, has become an increasing menace to the industry in the various valleys of the coast. It produces orange-colored pustules on stem and leaves, which later turn black. The fiber in the stems below the pustules is injured and becomes weak and brittle, thereby producing a large proportion of tow. Because of the nature of this disease, difficulty is experienced in fighting it directly, but it can be controlled by such measures as limiting the sowing season, rotating crops, and using seed free from straw particles that carry the spores (*1*, p. 12). The possibilities of developing fungus-resistant strains of flaxseed are being studied.

In addition to these fungus diseases, a number of insect pests, such as ground grubs and leaf grubs, have attacked flax plantings. The ground grubs eat off the tops of seedlings and the leaves of more advanced plants; the leaf grubs attack the leaves and stems (*1*).

GOVERNMENT AID AND REGULATIONS

The Flax Production Commission and government authorities have done much to assist the flax industry in Peru, not only by rendering financial aid and counsel, but by issuing regulations governing flax cultivation and industry, which protect the growers' interest.

Laws Governing Production

Under a law passed in June 1942 (*9*), the sowing of flax for fiber in the valleys between Pativilca on the north and Ica on the south was made illegal in any period except from May 15 to July 31. Exports of fiber not duly graded in accordance with Peruvian standards by officially recognized experts in this field were prohibited. Importation of seed by private individuals was forbidden; imports were limited to those made by application to the Bureau of Agriculture and Animal Husbandry for seed not to exceed 1 kilo (2.2046 pounds) in quantity and subject to test by the Technical Services of the Bureau mentioned as to sanitary conditions before delivery to the farmer.

The planting period in 1942 was extended until the 15th day of August, and the Bureau of Agriculture and Animal Husbandry was authorized to extend the planting season in the various regions when justified. The Ministry of Development and the Treasury were charged with enforcement of this decree.

In a decree dated April 27, 1943, the Ministry of Agriculture announced that the production of flax for fiber in the Sierra region would be permitted only where annual rainfall was sufficient without irrigation, and that flax for seed would be permitted on irrigated land and its control placed in the hands of the Commission for the Promotion of the Cultivation of Flax; that flax-scutching plants in the Sierra could only be installed when authorized by the Ministry of Agriculture.[10] This decree indicates that Peruvian authorities wish to encourage the cultivation of flax for fiber and seed in the Sierra region as a cash crop, with certain limitations specified in the decree.

In a resolution dated May 1943, date limits ranging from March 15 to July 31 were set, within which all flax for fiber must be planted.

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[10] HINKE, FREDERICK W. THE PRODUCTION OF FLAX AND PYRETHRUM IN THE SIERRA. U. S. Cons. Rpt. 176, 3 pp. Apr. 30, 1943. [Hectographed.]

Laws Regulating Processing (*10*)

A law passed in August 1942 put into effect the following regulations for the flax industry: Factory registration was made obligatory; the duties and responsibilities of official classers (flax graders) were specified and an annual license issued by the Commission required; all persons were forbidden to retain, sell, or offer for sale any quantity of long fiber or tow that had not been classed or baled according to official standards; any disagreement as to qualities or grades of fiber was made subject to settlement by the Commission; the Commission was authorized to supply a set of standards to each factory as well as to classers, to fix the valuation of these standards, and to delegate one or more members to make periodic inspections of the factories.

Export Taxes

Three export taxes were levied on flax fiber, each to be paid by the producer: (1) Unemployed tax - 1 percent ad valorem; (2) law 9484 - 10 percent of difference between price at Peruvian port and in excess of the 28 cents per pound fixed by law as the basis of its collection; and (3) an additional tax according to law 9466 - 10 percent of the difference in price at Peruvian port and in excess of the quotation of 35 cents per pound. These taxes represent about 6 percent of the selling price. The additional tax, according to law 9466, was suspended during 1942 because of unfavorable conditions then existing.

By strict compliance with the laws and regulations set up by the Government and the Flax Commission, the farmers of Peru have an opportunity to improve their economic status and increase the agricultural resources of the country. If they are able to add to the Western Hemisphere's short supply of flax fiber, they will also make a definite contribution to the United Nations war effort.

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